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A Review Article Localization and Traffic Density Short Term Forecasting in Non Motorized Vehicle Comprehensive Case Analysis

Mohammad Hashim Khan, HOD Mr. Vinay Deulkar
Department of Civil Engineering,
Jawaharlal Institute of Technology,
Borawan, Tehsil Kasrawad, District Khargone

Abstract- Non-motorized transport (NMT) is the use of a bicycle or walking to travel from one place to another. It is gaining popularity especially in the developed countries due to low transport externalities such as emissions and traffic congestion alongside its benefits to physical and mental health. In this paper, a comprehensive review of the existing literature related to NMT is presented focusing on the factors including built environment, geography, and weather, the health, and environmental benefits of NMT, and the motivational approach for increasing the use of NMT. The built environment, geography and weather, and socioeconomic factors significantly affect the use of NMT as a travel mode. This study reviewed some unique characteristics of NMT especially in developing countries to provide a clear understanding of the dynamics of NMT.

Keywords- Bicycle Non-motorized transportation Motor vehicles Pedestrian Sustainable transportation Walking.

I. INTRODUCTION

Non-motorized vehicles have played a major role in meeting the demand for door-to- door transport services in some south Asian developing countries. Popular non-motorized vehicles include Bangladesh's rickshaws and rickshaw-van, India's rickshaw-puller. These modes performed an important role in moving people and goods safely, efficiently and cheaply in the absence of so-called mass transport systems. Non-motorized vehicles account for 70 percent of vehicle trips in India metropolitan, more than anywhere else in the world.

Moreover the rickshaws contributed around 30 percent of the total value- added by the transport sector. This is more than double the contribution of all motorized road transport.

II. FUNDAMENTAL TRAFFIC PARAMETERS

In the study of traffic flow, two approaches immediately come to mind, i.e. macroscopic and microscopic.

The macroscopic approach considers the traffic stream as a whole and this is evident in the use of fluid flow and heat flow analogies to describe the behavior and conditions of the stream. The three fundamental parameters employed to describe macroscopic conditions are flow rate of volume (q), speed (u) and concentration or density (k).

Greenshield5 suggested a linear relationship between speed and density. The microscopic approach considers the behavior of individual vehicles in the traffic stream. This approach is very popular especially in the development of models to explain the prevailing condition of traffic flow, when fundamental traffic parameters cannot clearly explained the conditions. In this study both macroscopic and microscopic approaches used to analyze the observed data.

III. LITERATURE REVIEW

Weihua Zhang, Investigating factors affecting riders' behaviors of occupying motorized vehicle lanes on urban streets: The violation activity of non-motorized vehicles riding in motorized vehicle lanes interferes roadway traffic serious, as it can not only

seriously depreciate the efficiency of motorized vehicle traffic, but also raise possibility of triggering traffic accidents. The primary purpose of this study was to investigate intrinsic features of unlawful non-motorized vehicles' violation behaviors of riding on motorized vehicle lanes. The binary logistic regression model was proposed to find inherent reasons of triggering such misbehaviors. The misbehaviors of non-motorized vehicles (including regular bicycles, electric bicycles and human-powered tricycles) at seven sections, located at Hefei, China, were collected and studied.

The experimental results indicate that male traffic participants exhibit higher rates of traffic violations than females, and rainy days shows higher misbehaviors than sunny and cloudy days. Another finding is that morning peak violation rate is higher than the evening peak and non-peak hours due to the fact people are in hurry for work. The traffic density of motorized vehicles and the traffic density of non-motorized vehicles strongly affect illegal occupancy behavior.

The effect of dividing strip type and non-motorized vehicle type on lane illegal occupancy behavior are significant. We find that the average lane illegal occupancy rate of non-motorized vehicle is 36.1% which suggests that over one-third of non-motorized riders violate traffic rules. The findings of this study can help traffic authorities, road construction departments and traffic participants perform effective and efficient measurements to improve road traffic safety.

T.Ampe, The impact of a child bike seat and trailer on the objective overtaking behaviour of motorized vehicles passing cyclists: The lateral clearance distance of the overtaking man oeuvres of motorized vehicles was measured using an instrumented bicycle when performing 19 cycling trips on one single road with two different types of cycling infrastructure (a bike lane and shared lane marking) in the Brussels Capital Region (Belgium).

Mixed effect regression was used to examine the effect of cycling condition (cyclist without a child [control], cyclist with a child bike seat and cyclist with a child bike trailer) and secondary independent variables (i.e. cycling infrastructure, peak traffic hours and traffic density) on the lateral clearance distance. The mean lateral clearance distance in 'cyclists without child' was significantly smaller (117.3 cm) than in 'cyclists with child' (128.8 cm) (95%CI [7.2;15.9]).

Looking at 'morning peak traffic hours' (i.e. 7:00 to 9:00 a.m.) a cyclist with child bike seat was overtaken at greater lateral clearance distances than a cyclist with a child bike trailer or a cyclist without child ($p=0.041$). Furthermore, the percentage of passing maneuvers under 100 cm was significantly higher in 'cyclist without child' (35.3%) in comparison to 'cyclist with child bike seat' (21.8%) and 'cyclist with child bike trailer' (21.8%) ($Chi2=29.19$, $p<0.001$). No significant differences were found between a shared lane marking and bike lane.

QiyuanLiu, Modeling and simulation of overtaking events by heterogeneous non-motorized vehicles on shared roadway segments: Overtaking events performed by non-motorized vehicles have a profound effect on the level of service and safety of roads shared by motorized and non-motorized vehicles. With the proliferation of e-bikes, heterogeneity within non-motorized vehicles has grown, which results in the speed of these vehicles spreading out. As a result, the frequency of overtaking has risen, causing the decision-making process and action execution of non-motorized vehicle overtaking to become more complicated to depict.

To address this, this research identifies three types of typical delayed overtaking events based on empirical data. For each type of overtaking event, a utility-based multinomial log it sub-lane choice model and conditional probability-based overtaking motivation model are proposed to emulate the overtaking behavior of non-motorized vehicles. The model is calibrated and verified using 490 delayed overtaking trajectories that were captured during peak hours on two typical shared road segments in Shanghai, China. The proposed model is then integrated into a microscopic simulation platform and the simulation results ascertain that the proposed model performs well in estimating travel time, overtaking frequency, and the lateral location of heterogeneous non-motorized vehicles.

Yunchang Zhang, Quantifying the impact of COVID-19 on non-motorized transportation: A Bayesian structural time series model: The coronavirus disease (COVID-19) pandemic has

resulted in widespread impacts in the transportation sector due to containment measures. To better manage transportation during the COVID-19 crisis and improve future pre-pandemic planning, it is essential that we understand sufficiently the impact of the global epidemic on vehicle miles traveled, freight movement, and human mobility. The availability of pedestrian and bicycle count data allows us to estimate the causal impact of COVID-19 on non-motorized travel patterns.

To quantify the causal effects of COVID-19, a Bayesian structural time series (BSTS) model is proposed, with the "treatment" date defined as the date on which the national emergency was declared. The model is intended to (1) account for variations in local trends, seasonality and exogenous covariates before the treatment, (2) make predictions about the counterfactual trends after the treatment, (3) infer the causal effects between observed series and counterfactual series, and (4) evaluate the uncertainty about the causal inference.

Dorian Antonio Bautista-Hernández, Mode choice in commuting and the built environment in México City. Is there a chance for non-motorized travel?: Non-motorized transportation (NMT) has emerged as a mitigating alternative for the negative externalities of motorized travel. This research presents an overview of the intra-metropolitan geography of transportation mode choice in the journey to work in the México City Metropolitan Area (MCMA), which can be seen as a representation of the huge socioeconomic inequalities typical of the Global South. The regression model applied showed that, as expected, socioeconomic variables were strong determinants of mode choice. An increase in age, as well as lower categories of socioeconomic class and educational attainment, were associated with the use of transit and non-motorized travel.

Other factors positively associated with bike use were distance to the center, density of mass-transit systems stations, street intersection density, and the flat surface. The pattern of walk commuting with respect to the city center followed a u-shaped curve, while factors significantly positively associated were female, population density, the jobs-housing ratio at the origin, and the density of mass-transit systems stations. The paper concludes with a discussion of the research implications to leverage public policy efforts to promote NMT.

Paul Tranter, Hit the brakes: slowing existing motorized traffic: This chapter explains the importance of reducing the speed of motorized traffic as an alternative to policies that have sought to adapt the city and its citizens to speed. The chapter examines various approaches to reducing speed, including posted speed limits of 30 km/h (or 20 mph) or lower (either alone or in combination with other measures), and physical traffic calming involving changes to street widths, alignments and vertical profiles. An alternative to physical traffic calming is psychological traffic calming, which involves using non-physical cues to encourage drivers to slow down.

The concept of 'self-explaining roads', in which the road design tells the story of how drivers should behave, is outlined. The chapter also examines holistic approaches to reducing danger, such as Vision Zero, which has an aim of zero deaths through road crashes. Finally, we consider the safety implications of the potential implementation of autonomous vehicles and emphasize again, that whether the vehicle has a driver or not, the critical issue for active travel users is to slow motorized vehicles down.

Prateek Bansal, Impacts of Bus-stops on the Speed of Motorized Vehicles under Heterogeneous Traffic Conditions: A Case-Study of Delhi, India: The presence of friction generators1 such as bus-stops, intersections, petrol pumps and pedestrian crossings, etc. significantly influences the speed of traffic stream. Among all the friction generators, understanding the impact of bus-stops is particularly important from planning and modeling perspective in the Indian context. Therefore, this study presents a methodology to quantify the impact of bus-stops on the speed of other motorized vehicles (the total motorized vehicle fleet minus the buses) under heterogeneous traffic conditions.

The methodology was validated on the typical urban arterials in Delhi, India. Two types of data, location of bus-stops and speed profiles of motorized vehicles, were collected by GPS and V-box respectively. These two data sets were mapped and merged using ArcGIS. To understand the nature of traffic stream near bus-stops, 'influence regions' of bus-stops were extracted. Later, characteristic parameters such as lengths of the influence regions and average speeds in the influence regions were computed.

Finally, 95% confidence intervals of these characteristic parameters were obtained and regression analysis was performed to quantify the impact of bus-stops on the speed of motorized vehicles. The results of study suggest that the influence region of bus-stops on the corridors investigated varies from 140–170 meters and average speed of motorized vehicles in the influence region is reduced by 26–38% of the free flow speed.

These findings can better inform planners about the speeds used in traffic flow and travel demand modeling under heterogeneous conditions by helping them in accounting for the speed-reducing impacts of bus-stops.

Moreover, transit planners may also consider the magnitudes and characteristics of the influence regions of bus-stops while determining their locations along the corridor to minimize their adverse impacts on the speed of other motorized vehicles.

HongweiGUO, Traffic Behavior Analysis of Non-motorized Vehicle under Influence of Curb Parking: To analyze the lane-crossing behavior of non-motorized vehicles under the influence of curb parking, the lifetime data analysis method is adopted to examine the observed data for non-motorized vehicles. The concept named valid volume is introduced to describe the relation between the probability of lane-crossing behavior and non-motorized vehicle volume, evaluate the influence of curb parking, and then a nonparametric method and a parametric method are used to estimate the model with censored data.

The results indicate the curb parking has a significant influence on the traffic behavior of non-motorized vehicles. It can decrease the valid volume and increase the likelihood of lane-crossing behavior. The results are expected to help evaluate the influence of curb parking on non-motorized vehicles and improve the planning and management of curb parking.

AndreasBlitz, Mobility design as a means of promoting non-motorised travel behaviour? A literature review of concepts and findings on design functions: To promote non-motorised travel, many travel behaviour studies acknowledge the importance of the built environment to modal choice, for example with its density or mix of uses. From a mobility design theory perspective, however, objects and environments affect human perceptions, assessments and behaviour in at least three different ways: by their practical, aesthetic and emblematic functions. This review of existing evidence will argue that travel behaviour research has so far mainly focused on the practical function of the built environment. For that purpose, we systematically identified 56 relevant studies on the impacts of the built environment on non-motorized travel behaviour in the Web of Science database.

The focus of research on the practical design function primary involves land use distribution, street network connectivity and the presence of walking and cycling facilities. Only a small number of papers address the aesthetic and emblematic functions. These show that the perceived attractiveness of an environment and evoked feelings of traffic safety increase the likelihood of walking and cycling.

However, from a mobility design perspective, the results of the review indicate a gap regarding comprehensive research on the effects of the aesthetic and emblematic functions of the built environment.

Further research involving these functions might contribute to a better understanding of how to promote non-motorized travel more effectively. Moreover, limitations related to survey techniques, regional distribution and the comparability of results were identified.

YanliWang, Evaluation of urban redevelopment impact on non-motorized traffic: As an important component of city evolution, urban land redevelopment has an impact on transportation system. The current traffic impact analysis (TIA) is lack of a comprehensive component for non-motorized transportation under redevelopment. For a better guidance of land redevelopment and non-motorized transportation planning, it is necessary to evaluate the negative impact of redevelopment on non-motorized traffic in the TIA.

In this paper, an evaluation framework for the impact analysis is built up. We organized the procedures and components of impact evaluation, and proposed the corresponding qualitative and quantitative evaluation indicators for non-motorized traffic under redevelopment. Level of service (LOS) and its

criterion are employed for external impact evaluation, and level of safety, convenience, independence, and comfort which are four aspects of quality of service (QOS) are proposed to analyze the internal impact.

The framework is applied to a redevelopment study in Shanghai, China. The case study results indicate that the redevelopment from a residential area to a mixed commercial area has a significant impact on non-motorized traffic.

The potential negative impact from both external and internal traffic can be minimized by reasonable improvements in the internal land use design.

Christian Bongiorno, Comparing bicycling and pedestrian mobility: Patterns of non-motorized human mobility in Greater Boston: During the past 100 years, many large cities around the world prioritized individual transportation in cars over more sustainable and healthier modes of transportation. As a result, traffic jams, air pollution, and fatal accidents are a daily reality in most metropolis, in both developed and developing countries.

On the other hand, walking and bicycling are effective means of transportation for short to medium distances that offer advantages to both the city environment and the health of its citizens. While there is a large body of research in modeling and analysis of urban mobility based on motorized vehicles, there is much less research focusing on non-motorized vehicles, and almost no research on comparing pedestrian and cyclist behavior.

In this paper, we present a detailed quantitative analysis of two datasets, for the same period and location, covering pedestrian and bike sharing mobility. We contrast the mobility patterns in the two modes and discuss their implications. We show how pedestrian and bike mobility are affected by temperature, precipitation and time of day.

We also analyze the spatial distribution of non-motorized trips in Greater Boston and characterize the associated network of mobility flows with respect to multiple metrics. This work contributes to a better understanding of the characteristics of non-motorized urban mobility with respect to distance, duration, time of day, spatial distribution, as well as sensitivity to the weather.

Dong-FanXie, Characteristics of mixed traffic flow with non-motorized vehicles and motorized vehicles at an unsignalized intersection: In this paper, a new two-dimensional car-following model is proposed to depict the features of mixed traffic flow consisting of motorized vehicles (m-vehicle) and non-motorized vehicles (nm-vehicle), based on the two-dimensional optimal velocity (OV) model by Nakayama et al. [A. Nakayama, K. Hasebe, Y. Sugiyama, Phys. Rev. E 71 (2005) 036121].

In the proposed model, velocity difference terms are introduced, which are regarded as important factors for traffic behavior. Numerical simulations are carried out to investigate the interaction between left-turning nm-vehicle flow and straight-going m-vehicle flow at a typical unsignalized interaction.

The results show that the straight-going m-vehicle flow just next to nm-lane is disturbed more seriously than others. In addition, a well-known phenomenon in reality is observed that groups of m-vehicles and nm-vehicles pass through the intersection alternately.

IV. FORECASTING DATA

Forecasting is the process of making predictions based on past and present data. Later these can be compared (resolved) against what happens. For example, a company might estimate their revenue in the next year, and then compare it against the actual results. Prediction is a similar, but more general term.

Forecasting might refer to specific formal statistical methods employing time series, cross-sectional or longitudinal data, or alternatively to less formal judgmental methods or the process of prediction and resolution itself. Usage can differ between areas of application: for example, in hydrology the terms "forecast" and "forecasting" are sometimes reserved for estimates of values at certain specific future times, while the term "prediction" is used for more general estimates, such as the number of times floods will occur over a long period.

Risk and uncertainty are central to forecasting and prediction; it is generally considered good practice to indicate the degree of uncertainty attaching to forecasts. In any case, the data must be up to date in order for the forecast to be as accurate as possible.

In some cases the data used to predict the variable of interest is itself forecast.[1]

V. APPLICATIONS

Forecasting has applications in a wide range of fields where estimates of future conditions are useful. Depending on the field, accuracy varies significantly. If the factors that relate to what is being forecast are known and well understood and there is a significant amount of data that can be used, it is likely the final value will be close to the forecast. If this is not the case or if the actual outcome is affected by the forecasts, the reliability of the forecasts can be significantly lower.[4]

Climate change and increasing energy prices have led to the use of Egain Forecasting for buildings. These attempts to reduce the energy needed to heat the building, thus reducing the emission of greenhouse gases. Forecasting is used in customer demand planning in everyday business for manufacturing and distribution companies. While the veracity of predictions for actual stock returns is disputed through reference to the Efficient-market hypothesis, forecasting of broad economic trends is common. Such analysis is provided by both non-profit groups as well as by for-profit private institutions.[citation needed]

Forecasting foreign exchange movements is typically achieved through a combination of chart and fundamental analysis. An essential difference between chart analysis and fundamental economic analysis is that chartists study only the price action of a market, whereas fundamentalists attempt to look to the reasons behind the action. [5]

Financial institutions assimilate the evidence provided by their fundamental and chartist researchers into one note to provide a final projection on the currency in question.[6] Forecasting has also been used to predict the development of conflict situations.[7]

Forecasters perform research that uses empirical results to gauge the effectiveness of certain forecasting models.[8] However research has shown that there is little difference between the accuracy of the forecasts of experts knowledgeable in the conflict situation and those by individuals who knew much less.[9]

VI. CONCLUSION

Studied the fundamental characteristics of speed and flow. Time-headway distribution of urban heterogeneous traffic was also studied. The result of the study had shown that, the headways of urban heterogeneous traffic could be modelled for vehicles over a wide range of traffic flow levels.

According to the author more case studies and data sets were necessary to obtain further insights on headways and flows.

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